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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/766,896	01/22/2001	Hidemitsu Aoki	WAM-03401	2616

26339 7590 08/06/2003

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EXAMINER

DEO, DUY VU NGUYEN

ART UNIT PAPER NUMBER

1765

DATE MAILED: 08/06/2003

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/766,896

Applicant(s)

AOKI ET AL.

Examiner

DuyVu n Deo

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 10-14, 16-20, 22-26, 28 and 29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 10-14, 16-20, 22-26, 28, 29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 10-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Small (US 5,981,454) and Tanabe et al. (US 6,068,000).

Small describes a method for removal of chemical residues, which have been applied in a previous step, from the metal surface or dielectric surface of a semiconductor substrate using a solution comprising: gallic acid (hydroxyl aromatic compound), urea hydroperoxide (urea or an urea derivative), water, and hydroxylamine (col. 7, line 10, 35; col. 8, line 27; table III; claim 1). Unlike claimed invention, Small doesn't describe a water-soluble organic solvent Tanabe describes a solution for cleaning or removing degenerate resist on a metal where he teaches using water-soluble organic solvent (summary, col. 5, line 45-59). It would have been obvious for one skilled in the art to add a water-soluble organic solvent in light of Tanabe because Tanabe teaches that it would exhibit a high anticorrosive effect for metallic films.

Since Small's solution contains the same two ingredients, hydroxyl aromatic compound and urea/urea derivative as that of the claimed invention, these two components would also supplement each other to form a coating layer that imparts hydrophobicity to the exposed metal film.

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The concentration of gallic acid, urea hydroperoxide, hydroxylamine, and water are 1-25 wt%, 0.5-30 wt%, 30 wt%, and 5 wt% respectively (col. 7, line 22; col. 8, line 29; table III).

3. Claims 16-20, 22-26, 28, 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Small, Tanabe and Zhao et al. (US 6,204,192).

Unlike claimed invention, Small is silent about prior steps of patterning the dielectric layer to expose the metal layer including steps of forming a metal film (copper), 1st dielectric film, and resist or 2nd dielectric film, etching the 1st dielectric layer using the resist film or 2nd dielectric layer as a mask to expose the metal layer. However, these steps are well known to one skill in the art as shown here by Zhao (fig. 2; col. 4). It would have been obvious to one skill in the art at the time of the invention that Small's method can be used in any semiconductor process, such as a single or dual damascene process taught by Zhao, that has dielectric and metal layer in order to clean the dielectric and metal layers with an expected result.

4. Claims 10-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morinaga et al. (US 5,885,362) and Tanabe et al. (US 6,068,000).

Morinaga describes a method for cleaning semiconductor, metal, and glass surfaces using a solution comprising pyrogallol (hydroxy aromatic compound), urea and its derivatives, dimethylenethanolamine (alkanolamine), and water (col. 3, line 37-42; col. 5, line 10-12; col. 7, line 22; col. 8, line 34-40). Even though Morinaga doesn't describes stripping of resist or etching residues from the semiconductor substrate having exposed metal film. However, he teaches using the solution for cleaning/etching of semiconductor, metal, and glass surface (col. 13, line 55-63); therefore, it would have been obvious at the time of the invention for one skill in

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the art to use the solution in cleaning etching residues from the semiconductor wafer having exposed metal film in order to obtain a clean wafer.

Since Morinaga's solution contains the same two ingredients, hydroxyl aromatic compound and urea/urea derivative as that of the claimed invention, these two components would also supplement each other to form a coating layer that imparts hydrophobicity to the exposed metal film.

Unlike claimed invention, Morinaga doesn't describe a water-soluble organic solvent. Tanabe describes a solution for cleaning or removing degenerate resist on a metal where he teaches using water soluble organic solvent (summary, col. 5, line 45-59). It would have been obvious for one skilled in the art to add a water soluble organic solvent in light of Tanabe because Tanabe teaches that it would exhibit a high anticorrosive effect for metallic films.

Referring to claim 11, as shown in Morinaga, the amount of each of compound in the solution is determined through test runs in order to see the effective of various concentrations. Therefore, they are result-effective variables and would have been obvious for one skilled in the art to determine the compound concentrations through routine experimentation to achieve optimum concentration in order to clean the wafer with a reasonable expectation of success. See *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

5. Claims 16-20, 22-26, 28, 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morinaga, Tanabe, and Zhao et al. (US 6,204,192).

Unlike claimed invention, Morinaga is silent about prior steps forming a semiconductor wafer including steps of forming a metal film (copper), 1st dielectric film, and resist or 2nd dielectric film; etching the 1st dielectric layer using the resist film or 2nd dielectric layer as a

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mask to expose the metal layer. However, these steps are well known to one skill in the art as shown here by Zhao (fig. 2; col. 4). It would have been obvious to one skill in the art at the time of the invention that Morinaga's method can be used in any semiconductor process, such as a single or dual damascene process taught by Zhao, because Morinaga teaches that his solution can be used to clean/etch semiconductor substrate and prevents a substrate from being deposited with metal impurities (col. 3, line 13-18).

Response to Arguments

6. Referring to applicant's argument that Small fails to suggest the mixture of urea and hydroxyaromatic compounds, please see col. 6, line 44, 45 where he suggests a variety of chemicals can be used in the solution which would includes acid such as gallic (hydroxyaromatic compound (col. 7, line 10) and oxidizers such as urea hydroperoxide (urea derivative) (col. 8, line 27).

Referring to applicant's argument that the use of these components as anticorrosive is contrary to the teaching of Small, which describes them as oxidizers as shown in col. 7, line 39, first of all, there is no teaching of gallic acid is an oxidizer in Small, second of all, please see col. 11, line 44-46, where he teaches that the metal features on the wafer must not be etched or corroded after leaving the cleaning chemistry. This would suggest that these components in the solution would be anticorrosive.

In response to applicant's argument that applied prior art, Small or Morinaga, doesn't suggest components urea or urea derivative and hydroxy aromatic compound supplement each other to form a coating layer that imparts hydrophobicity to the exposed metal film, the fact that applicant has recognized another advantage which would flow naturally from following the

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suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985).

Morinaga teaching of preventing metal deposition on the substrate does not relate or teach against to components urea or urea derivative and hydroxy aromatic compound forming a coating layer on the surface because this layer, formed from pyrogallol and urea, is not a metal layer. As described by the claims, the coating is formed from these two components and Morinaga's solution includes these two same components; therefore, these two components would form a coating on the surface that imparts hydrophobicity.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DuyVu n Deo whose telephone number is 703-305-0515.

DVD

August 5, 2003

